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APPENDIX 2—REPORT OF COMMITTEE ON VARIABLE STARS IN CLUSTERS

PRÉSIDENT: Mrs Dr H. B. Sawyer Hogg, David Dunlap Observatory, Richmond Hill, Ontario, Canada.

MEMBRES: Arp, Rosino and Wesselink.

Introduction

This report will follow the outline adopted in the report of Sub-Commission 27*b* for the 1961 IAU meeting. Researches now in progress or published since the preparation of that report, and the meeting of the Sub-Commission will be considered under the following sections. 1. Variables in globular clusters. 2. Variables in galactic clusters and associations. 3. Variables in star clusters of external galaxies. There is less information in this report on current researches and unpublished material than the writer expected because members of the Commission did not send in material as fully as could be wished.

1. *Variables in Globular Clusters*

(*a*) *Discovery of new variables and derivation of periods.*

There are now 119 clusters catalogued as globular. In these 1688 variables have been published, with 85 clusters examined; five of these clusters have no variables, and three have only unpublished variables, which now total 23 for all clusters.

Table 1 lists those clusters, with references, in which data on new variables and their positions, and new or revised periods, have actually been published. Information on clusters under investigation, in which data are not yet available for periods or positions of new variables will be found in § 1(*e*).

(*b*) *Discussions of the RR Lyrae stars*

(1) *New variables and periods.* L. Rosino has been very active in the discovery of new variables in clusters, as shown in Table 1. In NGC5824 (**5**) he has found 27 new variables and nine periods. The median magnitudes of the RR Lyrae stars are concentrated toward a mean value of 17·65 and the period frequency distribution has a double maximum. In NGC6229 P. Mayer (**12**) has provisional periods for 10 of the 20 RR Lyrae stars discovered by Baade. The mean period of two *c*-type variables is 0·298, that of eight *a*-type is 0·518. Miss M. Harwood (**16**) in her comprehensive investigation of the Scutum Cloud has found new variables and determined several periods in NGC6712.

P. N. Kholopov (**3**) has discovered 18 new variable stars in the central region of M3. B. V. Kukarkin (**9**) has studied 19 variables in NGC6171. The mean period of 11 RR*a* type variables is $0^{d}.535$, and that of 7 RR*c* type $0^{d}.287$. Mannino (**10**) simultaneously determined periods of 10 variables in the same cluster, several of which differed from those determined by Kukarkin.

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Table 1. Published Data on Individual Variables and Periods

NGC	New Variables	New Periods	Revision or New Obs.	Investigator	Ref.
104	1	5		Arp, Brueckel, Lourens	1
5139	1			Wilkens	2
5272	18			Kholopov	3
5466	4			Cuffey	4
5824	27	9		Rosino	5
Pal 5			3	Kinman and Rosino	6
5986	5			Rosino	7
6121			Co-ords.	Hoffmeister	8
6171		18		Kukarkin	9
		10		Mannino	10
			Obs.	van Agt	11
6229		10		Mayer	12
6304	11			Rosino	7
6362	16			van Agt	13
	8	15		Van Hoof	14
6397			Var. 4	Woolley *et al.*	15
6558	9			Rosino	7
IC 1276	4	1		Kinman and Rosino	6
6569	5			Rosino	7
6637	5			Rosino	7
6681	2			Rosino	7
6712	2	3		Harwood	16
6779		1		Rosino	17
7078	3	3		Tsoo	18
7089			19	Fritze	19
			8	Kulikov	20
			4	Mantegazza	21
7099		1		Rosino	17
Pal 12	2			Kinman and Rosino	6
7492			Var. 1	Cuffey	22
		1		Kinman and Rosino	6

H. Sawyer Hogg and C. Coutts are checking the periods on David Dunlap plates. V. I. Kulikov (**20**) has studied eight variables in M2, and N. B. Perova (**23**) some variables in NGC5053. N. P. Kukarkina and B. V. Kukarkin (**24**) have studied three RR Lyrae variables with Blazhko effect in M3.

(2) *Colours and magnitudes.* Arp (**25**) has shown that the application of the best observed reddening coefficient, as determined by Kron and Mayall for the magnitudes of certain clusters leads to a revision of the absolute magnitudes of the RR Lyrae stars (as well as to the ages of the clusters). The M_V values of the RR Lyrae stars in these clusters are as follows: NGC5272, +0·3; NGC5904, +0·3; NGC6205, +0·1; NGC7089, +0·6. Tifft (**26**) has discussed the colours of the RR Lyrae stars in 47 Tuc in relation to the colour-magnitude diagram.

(3) *Spectra.* Preston (**27**) has obtained for six RR Lyrae stars in M5, M15 and M92 low dispersion spectra with the nebular spectrograph on the 100-inch. Denoting the difference between spectral types based on hydrogen lines and on the K-line of Ca II as ΔS, he finds that the RR Lyrae stars in M15 and M92 fall near the upper ΔS limit of a field star sample. This limit corresponds to a metals-to-hydrogen ratio of the order of 500 times smaller than the solar value.

(4) *Period changes.* In NGC5139 Belserene (**28**) finds that for 32 stars the rate of change of period from 1896 to 1957 is $+4 \times 10^{-10}$ days per day. Individual values range from -31×10^{-10} to $+52 \times 10^{-10}$. The maximum in frequency distribution of rates of change is at $+3 \times 10^{-10}$. In NGC7078, of 19 variables investigated, Fritze (**19**) finds that four show linear period changes in the interval 1897–1956, eight show no changes, and no definite conclusion is possible for the others.

(5) *The pulsation constant.* For the RR Lyrae stars in M3, G. M. Preston (**29**) has calculated the pulsation constant Q from the data on 46 variables. He considers the problem whether or not the RR Lyrae stars in M3 constitute a homologous family of variable stars. J. Smak (**30**) has also independently determined the pulsation constant in a discussion of the theoretical P-$(B-V)$ relations, and finds that these data do not confirm an earlier assumption that the variables of subclass *c* pulsate in the first overtone.

(6) *Variables in the surroundings of globular clusters.* N. E. Kurochkin (**31**) has discussed 12 new variable stars in the $10° \times 10°$ field around M3. Eight of them are RR Lyrae stars. The excess spatial density of RR Lyrae variables near the cluster suggests that it is due to dissipation of RR Lyrae type stars from the cluster. Some statistical considerations led the author to the conclusion that about 20 per cent of RR Lyrae type stars in the galactic field could have originated in the globular clusters. In the continuation of this work (**32**) ten more variable stars were discovered in high galactic latitudes around M3 and NGC5466. Another article by the same author (**33**) is devoted to RR Lyrae stars in the vicinity of NGC104, 362, 5139, 5272, 5466 and 6205. In six cases out of the seven the excess of RR Lyrae variables was established around the clusters in comparison with their expected numbers in the surrounding regions. This was also interpreted as evidence of the dissipation of these stars from the clusters. N. E. Kurochkin has also discovered 17 new variable stars in the wide surroundings of M15 ($10° \times 10°$). The physical characteristics of three of them are the same as those of variables in the cluster. B. V. Kukarkin (**34**) has investigated two RR Lyrae variables near NGC6171, discovered by N. E. Kurochkin. L. Rosino has found numbers of new variables in the field of some of the clusters listed in Table 1. The numbers of field variables are as follows: NGC6558, 13; NGC6569, 3; NGC6637, 5; NGC6681, 3.

(7) *Miscellaneous.* H. Wilkens has prepared a discussion of the globular clusters richest in variable stars (**35**), following his earlier investigations of diameters of clusters from variables. J. Ponsen (**36**) has searched for δ-Scuti type variables (the so-called RR Lyrae stars with P less than 0·20 day) on Radcliffe 74-inch plates. He examined stars about four magnitudes fainter than the cluster-type variables, but no variables were found.

(*c*) *Discussion of variables not of RR Lyrae type*

In 47 Tucanae, H. Arp, F. Brueckel and J. v. B. Lourens (**1**) have investigated the long-period and red variables in both *B* and *V* wavelengths over a period of two years. They state that the variables fall into three well-marked period groups, of 200 days, 160 days, and 50 days. The stars with 50-day periods fall directly off the end of the giant branch in the colour magnitude diagram. The variables must evolve rapidly and discontinuously from 50 days to 200 days. In the same cluster, M. W. Feast (**37**) has made spectroscopic studies, measuring the strength of Cr I 4254 compared with nearby weaker lines for the three Me variables. These three have a metal deficiency similar to that derived for other members of 47 Tuc, a factor of four less than the Sun.

G. W. Preston, W. Krzeminski and J. Smak in a spectroscopic and photo-electric survey of the RV Tauri stars (**38**) have studied the spectrum of Var. 11 in M2 and Var. 6 in M56, and published spectrum prints. They classify these stars as members of their spectroscopic Group *C* in which the bands of CN and CH are weak or absent at all phases.

R. B. Stothers and M. Schwarzschild (**39**) have derived a theoretical value for the pulsation period of long period variables in globular clusters from theoretical evolution curves on model

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sequences, and find the comparison with observed values satisfactory. Stothers has given a full discussion of variables with period greater than 20 days in globular clusters (**40**) with a catalogue of these variables. He finds that for eighty probable cluster members in 31 clusters the most frequent period is about 100 days. He derives many correlations of period, luminosity, and amplitude.

In their study of Cepheids of the northern Milky Way, K. Bahner, W. A. Hiltner, and R. P. Kraft (**41**) have compared metal abundance with that in M2, M5, and M13.

In M3, J. B. Breckinridge (**42**) has searched for a long-term luminosity change in the giant stars, comparing plates taken in 1900 with the Lick Crossley reflector with plates taken recently. The systematic change in m_{pg} is less than 0·08 mag. for selected stars on the giant and horizontal branches.

(*d*) *Bibliographical material*

A recent summary of the numbers and types of variables in globular clusters has been given by Sawyer Hogg (**43**). References to work on variables in individual clusters may be found amongst the compilation of all the globular cluster literature from 1947–62 in *A Bibliography of Individual Globular Clusters*, *First Supplement*, by H. B. Sawyer Hogg (**44**). A bibliography for variables with period greater than 20 days in clusters is given by R. B. Stothers (**40**). References to variables in clusters may also be found in the annual supplements by G. Alter, H. S. Hogg and J. Ruprecht to the *Catalogue of Star Clusters and Associations*, published annually as an appendix to the Bulletin of the Astronomical Institutes of Czechoslovakia.

H. Sawyer Hogg plans to publish the Third Edition of the Catalogue of Variable Stars in Globular Clusters in 1964 or 1965.

(*e*) *Reports of Miscellaneous Current Investigations*
(Details still to be published).

NGC3201 H. Wilkens at La Plata is working on period changes, but needs early definitive dates. He is also renewing the hunt for variables in the outskirts of the cluster.

NGC5024 J. Cuffey (**45**) with plates from the 100-inch has found four new variables and 12 probable ones. A. Wachmann at Hamburg Bergedorf is studying period changes, as is Marzoni at Asiago.

NGC5139 H. Arp has determined two colour light curves of the long period variables, with results similar to those for the long periods in 47 Tuc. The period of Var. 2 formerly thought to be greater than 400 days proves to be 230 days (**46**). H. Wilkens (La Plata) has found 10 new variables in the surroundings of the cluster, and five probable ones. He is pursuing an investigation of period changes for 130 variables.

NGC5904 H. Arp reports an observed flare-up of Oosterhoff's U Gem-type star in this cluster.

NGC6121 From new observational material for 30 variables, H. Wilkens finds that the new RR Lyrae variables, Bailey type *a*, possess either a constant period or a strongly variable period, while those of type *c* possess only a constant period.

NGC6341 R. S. Kheilo is investigating the variable stars. Three of them have shown the Blazhko effect.

NGC6402 H. Sawyer Hogg and A. Wehlau (**47**) report a probable nova in this cluster. The nova was discovered by A. Wehlau at Hume Cronyn Observatory during a systematic program of photometry in this cluster, in which periods have now been determined for more than 20 variables. The nova is near the cluster centre, and appears about magnitude 16·0 on all eight plates taken with the 74-inch David Dunlap reflector from June 21 to June 28, 1938. It does not appear on any of the other 247 plates in the collection, taken by H. Sawyer Hogg in 23 of the years from 1932–63 inclusive, with this reflector and that of the Dominion Astrophysical Observatory. This is the first nova recorded photographically in a globular cluster. This cluster is also under investigation by Marzoni at Asiago for elements of variables.

NGC6712 First reports on their work on variables in this cluster have been made by L. Smith and A. Sandage (**48**) (**49**). They report seven RR Lyrae variables, with B and V light curves determined for all seven, and four variables of long period. They are studying the relation of group characteristics to metal abundance in a cluster.

Rosino reports that his paper on the elements of variables in this cluster is in press.

NGC6864 A paper by Rosino on the elements of the variables is in press.

NGC6934 Periods of forty variables have now been determined by H. Sawyer Hogg and will soon be published.

NGC6981 Marzoni is determining elements of variables.

2. *Variables in Galactic Clusters and Associations*

The study of the variables in galactic clusters and associations continues to be pursued generally along the lines of the type of variable studied. Accordingly we will consider the material in this way, under (*a*) Cepheids, (*b*) Eclipsing variables and (*c*) Irregular variables in young clusters and associations. This latter field is summarized in a report prepared by George H. Herbig which is a supplement to his report prepared for the 1961 General Assembly of the IAU (**50**).

(*a*) *Cepheids in galactic clusters*

(1) *New variables*

NGC188. Worthy of special note is the information, communicated by C. Hoffmeister, that N. Richter reports the discovery of an RR-Lyrae type variable in this cluster, with period $2^h\ 45^m$, and a range of $0\overset{m}{.}8$, besides 5 suspected variables, all around 17^m. These results have been obtained in an investigation of variables in old galactic clusters at the Karl Schwarzschild Observatory, Tautenberg nr. Jena, with the Schmidt camera 134/200/4000 cm.

Melotte 66. In this cluster, whose classification as globular or galactic is uncertain, O. J. Eggen and R. H. Stoy (**51**) have found a variable star which varies from 14·57 to 14·76.

NGC6649. One new variable, a probable Cepheid with period 5–6 days, range 11·3 to 11·8, has been found by C. Roslund and W. Pretorius from photo-electric observations at the Boyden Observatory (**52**). It is currently under investigation by P. S. The and Roslund at the Bosscha Observatory (**53**).

(2) *Discussions of known Cepheids*

NGC129, DL Cas. A. P. Lenham and O. G. Franz (**54**) have determined proper motions of 70 stars in the region and state that on the basis of its proper motion DL Cas has a very high probability of being a cluster member. R. P. Kraft (**55**) has made a thorough study of six Cepheids in galactic clusters, with a precise determination of their absolute magnitudes and of the period-colour and period-luminosity relation. For DL Cas $M_v = -3{\cdot}84$, $\log P = 0{\cdot}908$.

NGC6087, S Nor. J. D. Fernie (**56**) has determined $M_v = -3{\cdot}7$ for S Nor, with a distance of 760 pc for the cluster. The period of this Cepheid may be increasing at the rate of five seconds per year, a possible evolutionary effect. Kraft's determination of M_v for S Nor is $-3{\cdot}96$ (**55**).

NGC6639, X Sct. R. I. Mitchell (**57**) finds that X Sct, one cluster diameter away from NGC6639, lies near the point of convergence of three lines of bright stars in this cluster. A true distance modulus of 11·6 for the cluster indicates M_v is $-3{\cdot}3$ for the Cepheid.

NGC6664, EV Sct. Kraft (**55**) determines M_v for this star as $-2{\cdot}62$, with $\log P = 0{\cdot}490$.

M25 = IC4725, U Sgr. R. I. Mitchell, H. L. Johnson and B. Iriarte (**58**) have made three colour photo-electric observations and formed a phase magnitude diagram in V, $B-V$, and $U-B$. They determine a new period of 6·744935 days. J. Wampler, P. Pesch, W. A. Hiltner, and R. P. Kraft (**59**) have conducted a new U, B, V, investigation to try to resolve the differences in magnitude and colour obtained by various observers. Their magnitudes are in substantial agreement with those of Johnson, but not of Eggen. The true modulus of M25 is 9·08, and for U Sgr, M_v is $-4·02$. Kraft (**55**) later gave M_v as $-3·92$.

NGC7790. At Hamburg-Bergedorf Observatory, M. Beyer is observing visually in different colours the δ-Cephei stars in this cluster.

CV Mon. In the case of the Cepheid CV Mon, Kraft (**55**) questions the existence of the cluster in which it might be located.

(3) *Variable searches*

In M39 a systematic search for variables has been conducted by I. Semeniuk (**60**) with the 5½-inch astrograph at Ostrowik station of Warsaw Observatory. Forty members of this cluster were examined for variability with a Mϕ -2 constant diaphragm microphotometer and no light variations greater than a few hundredths of a magnitude were detected.

(*b*) *Eclipsing variables in galactic clusters and associations*

The search for these binaries continues to follow the general line of lists of binaries in optical association with clusters, with some intensive work on the identification of specific binaries as cluster members.

O. J. Eggen (**61**) in his paper on the period-colour relation for contact binaries, notes that four of these systems occur in galactic clusters. These are TX Cnc in Praesepe, IR Car in NGC3532, RX Com in Coma, and V 701 Sco in NGC6383. To this list J. Sahade and F. B. Dávila (**62**) have added four systems which are members of two moving clusters, as follows: AG Per in the ζ Per cluster, and β Aur, RR Lyn and α CrB in the Ursa Major cluster.

On the other hand, L. L. E. Braes (**63**) reports that the W UMa type variable BS Car is *not* a member of the galactic cluster IC2602, but is a background star. He reaches the conclusion from the great distance of the star from the cluster centre and its low maximum brightness of 14·7, with cluster distance of 155 pc.

Sahade and Dávila (**62**) have also made a list of eclipsing binaries which are certain, probable, and possible members of galactic clusters, using certain criteria. They list 25 systems which are, and 6 systems which probably are members of galactic clusters. This list has 23 objects in common with that of P. N. Kholopov (**64**) and 17 with that of R. P. Kraft and A. U. Landolt (**65**).

I. Semeniuk (**66**) has made a similar compilation of eclipsing binaries in O-B associations, noting that AG Per (above) belongs to II Per and μ' Sco is a member of the Scorpio-Centaurus stream. He finds a total of 108 eclipsing binaries from Kukarkin's General Catalogue to be in optical coincidence with 24 of 29 associations from the catalogues of Morgan and Schmidt. He thinks more positive conclusions about membership may be drawn than did Kraft and and Landolt, and states that on the basis of distance moduli, 17 of these variables are very probably members of the associations and are specially recommended to observers of eclipsing binaries.

(*c*) *Irregular Variables in Young Clusters and Associations*

A Supplement to *Report on Irregular Variable Stars in Young Clusters and Associations: Trans. IAU* **11**A, 275–278, 1962. (prepared by G. H. Herbig).

This supplement simply brings up to about October 1963 the survey published in the last report of Commission 27. A number of additional areas have been surveyed for emission-Hα stars at Abastumani (see, for example, M. Dolidze in *Astr. Cirk. URSS* no. 224, 18, 1961), Lembang, Tonantzintla, and Mt. Hamilton, but until details are published, it has been felt best not to include these regions in the Table.

No reference is made in the Table to two long articles in which additional data on some of these regions may be found: W. Wenzel, 'Einige Eigenschaften der unregelmässig veränderlichen Sterne geringer Leuchtkraft', *Veröff. Sternw. Sonneberg*, **5**, 7, 1961, and G. H. Herbig, 'The Properties and Problems of T Tauri Stars and Related Objects', *Advances in Astronomy and Astrophysics*, **1**, 47. Academic Press, New York: 1962.

Irregular variables in Young Clusters and Associations

A. The following new literature references should be added to the Table 2 of the report hereabove mentioned.

Region	α, δ (1900) h m °	Spectroscopic survey (usually at Hα) by:	Slit spectroscopic observations by:	Variable star search or observations by:
C214	0 00, +68	74	92	
IC1848	2 44, +60			92
Dark nebula	2 50, +19	86		
NGC1333	3 23, +31	83,122	122	
Tau-Aur dark clouds	4^h-5^h, $+16° - +30°$		76,77	70,71,88,89,92, 99,100,116
NGC1788	5 02, −3	83		
Dark nebula B30, 31, 32, 225	5 26, +12	78,82	76	
Orion Nebula NGC1977	5 30, −6; 5 30, −5	75	76,77,117,118	75,109,111
IC434	5 36, −2			87,108
NGC2024	5 37, −2			108
NGC2068, 2071	5 42, 0	94	94	
NGC2245, 2247 IC446	6 27, +10	107		92
NGC2264	6 36, +10		117,118	92,106,121
Lupus dark clouds	15 40, −35	114		72,73,92,97
Sco-Oph dark clouds	16 25, −24	81,85,95,104		
Dark nebula B59	17 05, −27	112		
M8, M20, S188	18 00, −25			105
NGC6726, 6727 6729	18 55, −37		77	
NGC7000, IC5070	20 50, +44			119
NGC7023	21 01, +68			110
IC5146	21 50, +47	80		

B. The following newly-studied regions are to be added to the Table:

Region	α, δ (1900) h m °	Spectroscopic survey (usually at Hα) by:	Slit spectroscopic observations by:	Variable star search or observations by:
Pleiades	3 42, +24	90,93	93	90
Diffuse nebulosity	5 10, −5	79		
Obscured region south of Orion Nebula	5 35, −7	14,22,35	35	101,102
NGC2244	6 26, +5	35		103
Obscured areas near ϵ Cha	12 00, −78	91,98	91	97,98
Southern Coal Sack	12 37, −62	96,120		

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Region	α, δ (1900) h m °	Spectroscopic survey (usually Hα) by:	Slit spectroscopic observations by:	Variable star search or observations by:
Nebulous region near m Cen	13 06, −63	115		
Nebulous region near ϵ, θ Cir	15 00, −63	112		
Nebulous region	17 15, −39	112		
Obscured region near β Sct	18 40, −4	113		
S10 (in I Lac)	22 42, +40	84		

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Other observations

The data supplied by Herbig in the preceding supplement has been amplified by L. Rosino reporting on the work done and under way at Asiago and by P. N. Kholopov reporting on the work in the Soviet Union.

Rosino states that nebular variables in young clusters or in T associations have been studied in Asiago during the last three years on blue and infra-red photographs obtained with the 122-cm telescope and with the 50/40-cm Schmidt. The examined regions are:

Field centred in Orion Trapezium. In continuing the researches on this important association, 105 new variable stars have been discovered and 16 flares observed, and 103 previously known variables have been studied. (Herbig Ref. 109).

Field centred on ζ Orionis (IC434 and NGC2024). 102 new variable stars of the nebular type have been discovered by Rosino and Tomissich in a field of 30 square degrees, (in press).

NGC7023. This is a T association with a clustering of nebular variables around BD + 67° 1283. Twelve variable stars have been studied by Rosino and Romano (Herbig Ref. 110).

NGC6530-Messier 8. Forty-seven nebular variables have been studied and 27 discovered by Rosino and Carraro (in press).

NGC1999. Nine variable stars have been discovered and 48 observed by Maffei. (Herbig Ref. 101).

49 Ori and NGC2244 at the centre of the Rosette Nebula: 8 and 15 new variable stars have been found in these regions by Maffei, most of which are of the nebular type (Herbig Ref. 102, 103).

The following associations of stars and nebulae are under advanced study by Maffei: NGC6618 (8 new var.); NGC6514 (12 var.); NGC1579; IC405 (8 var.); IC447 and NGC2264 (50 new var.). The fields of Lambda Orionis and NGC7000, IC5070 are under investigation by Rosino.

In U.S.S.R., V. P. Fedorovitch (Herbig Ref. 87) has studied the brightness of 98 Hα emission stars discovered by G. Haro and A. Moreno in the region of ζ Ori in 1953. It is shown that 42 of them are variables, probably RW Aur type. H. S. Badalyan (Herbig Ref. 72) has investigated 40 T Tauri type stars in the dark clouds in Taurus.

3. *Variables in Star Clusters of External Galaxies*

This field is still concerned chiefly with the clusters associated with the Magellanic Clouds. A. J. Wesselink reports that he is proceeding with the publication of his work on the variables in NGC1466. This is one of the three globular clusters (the other two are NGC121 and 2257) in which RR Lyrae stars were discovered about ten years ago at the Radcliffe Observatory (**67**). The mean apparent magnitudes of these stars of 19·0 give a new distance of about 50 kpc. Wesselink has also found five RR Lyrae stars in the general field of the Small Cloud, a different field from that of Dessy at Cordoba. In NGC121 W. G. Tifft (**68**) has investigated periods of variables found in 1958 by Thackeray. Of these, seven are cluster type, two are red giants (with periods 140 and 112 days). In addition four new variables have been found, two cluster type, one red variable and one type II Cepheid. Tifft states that this is the first type II Cepheid definitely identified in either Cloud. P. W. Hodge and F. W. Wright (**69**) have located population II Cepheids in the population II globular clusters in the Large Cloud. They have found 12 variables, with periods ranging from 0·99 to 6·6 days, in nine clusters, and three other variables in the vicinities. The period-luminosity relation for these cepheids is more than one magnitude more luminous than expected. This may be explained by metal abundance or reduction of the distance modulus of the Clouds. In the so-called 'blue' globular cluster NGC1831, Hodge (**70**) has identified five variables from 60-inch Boyden plates. They all have a visual apparent magnitude of approximately 18. Arp reports that photographic light curves have been obtained for seven Cepheids in NGC1866 in the Large Magellanic Cloud. Their periods range between 2·6 and 3·5 days. Two other variables have either incorrect or irregular periods so far. A small amount of photo-visual data is also available which will be used to study the place of these variables in the colour-magnitude diagram of NGC1866. J. L. Sérsic (**71**) has compared the magnitudes of the RR Lyrae stars in the Cloud clusters to derive a mean absolute magnitude for them.

We conclude this report with the comment that the field of variable stars in clusters is exceedingly active at the present time, and is contributing a great deal to our understanding of the clusters. We look forward to the time when it is extended to clusters in external galaxies farther from us than the Magellanic Clouds.

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